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THE RIBBON-TAILED BIRD OF PARADISE (*ASTRAPIA MAYERI*) AND ITS ALLIES

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HISTORY OF DISCOVERY

Until a few years ago only two species of *Astrapia* were known from the main portion of New Guinea, in addition to the two isolated species *nigra* (Arfak Peninsula) and *rothschildi* (Huon Peninsula), namely, *A. splendidissima* of the Weyland and Snow Mountains in the west and *A. stephaniae* of the mountains of southeast New Guinea. Nothing was known from the vast intervening area except seven females and immature males from Schraederberg (fig. 1a), south of the Sepik, which were described by Neumann (1922) as *A. stephaniae feminina*.

In 1933 the Mt. Hagen area (fig. 1b) of central New Guinea was opened up by prospectors, and not long thereafter a new *Astrapia* was discovered. The history of the discovery is well described by Stonor (February, 1939). At first only the two central tail feathers, taken from a native headdress, became known, together with a few other feathers. But Stonor, as did Shaw Mayer, the discoverer, recognized at once not only that he was dealing with a previously undescribed species of *Astrapia* but that it was somewhat intermediate between *A. stephaniae* and *splendidissima*, although differing from both in the extreme length and narrowness of the central tail feathers. The first complete specimen was reported less than a year later (December, 1939) by Kinghorn, who rather confusingly placed the species in a separate genus.

Stonor was justifiably troubled by Neumann's *A. feminina*, but he ruled the latter out as possibly representing the unknown female of the Ribbon-tail because of its solid brown tail. "But

in *A. splendidissima*, the other member of the genus with white on the tail, this character is in both sexes; and since the male of the new species [*mayeri*] has considerably more white than *splendidissima*, it is hardly likely that the female has none at all, as is evidently the case with *feminina*, from Neumann's description" (Stonor, 1939, p. 60).

Mayr (in Zimmer and Mayr, 1943, p. 259), on the other hand, considered *mayeri* as a possible synonym of *feminina* in view of

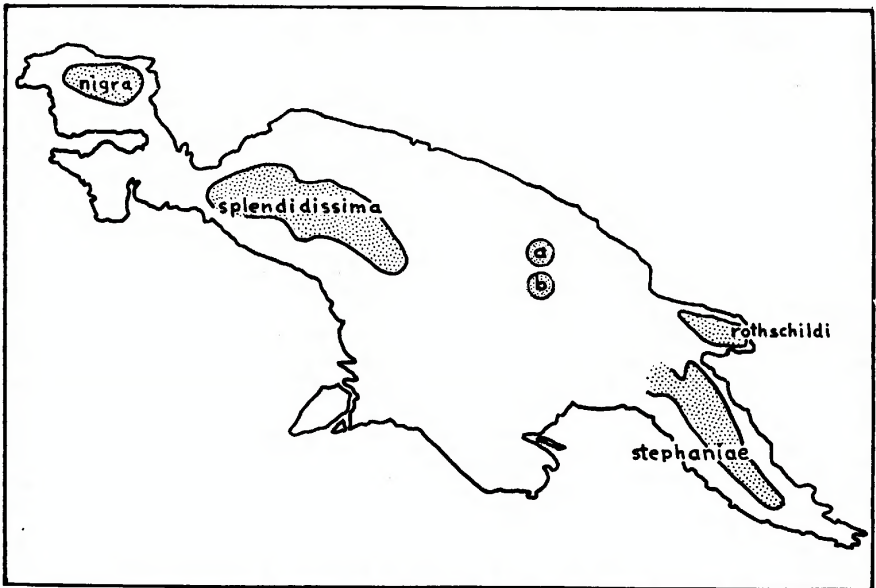


FIG. 1. Knowledge of *Astrapia* at the time of discovery of *A. mayeri*. a. Type locality of *feminina*. b. Type locality of *mayeri*.

the fact that the type localities of *mayeri* (fig. 1b) and *feminina* (fig. 1a) are less than 40 miles apart, while both these localities are more than 375 miles from the type locality of *stephaniae*. "The fact that the base of the tail is without white in females of *feminina* cannot be considered a decisive objection against this interpretation since '*mayeri*' is intermediate between *splendidissima* and *stephaniae* in many respects, and it is quite possible that the females of '*mayeri*' are more similar to *stephaniae* than the males. The case cannot be decided until the female of *mayeri* or the male of *feminina* is collected at its respective type locality."

The recent collections of Shaw Mayer (1949) and Gilliard (1950) prove that both Stonor and Mayr were partly wrong. Mayr

was right in his assumption concerning tail coloration; the tail of adult females and immature males of *mayeri* may indeed have no white at all. Stonor was right in his assumption of the validity of *mayeri*; much additional evidence has accumulated to show that *mayeri* is indeed very distinct while *feminina* appears to be only slightly different from *stephaniae*.

DESCRIPTION AND DIAGNOSIS OF *ASTRAPIA MAYERI* STONOR

Since the previous accounts (Stonor, 1939; Kinghorn, 1939) do not bring out clearly the diagnostic features of *A. mayeri*, we present here a description of the various plumages as well as the diagnostic characters of *mayeri* as compared with *stephaniae*.

ALL PLUMAGES

DIAGNOSIS: Differs from *stephaniae* by the narrower and more pointed tail feathers; by average larger wing; by a shorter bill with a much shorter exposed culmen; and by different tail proportions (difference between the outermost [first] and the fifth pair of tail feathers is much less).

ADULT MALES

Bill protruding only a little (9–12 mm.) beyond a large, velvety, ball-like tuft of glossy feathers on the forehead; lores, crown, and central occiput iridescent green, with a golden cast; ear coverts and dark areas bordering crown velvet black with deep violet-blue reflections; hind neck separated from upper back by a greenish bronze cape of fairly glossy feathers; back and scapulars velvet black, with a dull bronze sheen; rump and upper tail coverts jet black; chin, throat, sides of neck, and malar region iridescent green, with a slight bluish cast; breast covered by a broad velvet black shield (approximately 28 mm. wide) which is edged posteriorly by a narrow, iridescent, reddish copper band (approximately 5 mm. wide at sides) which extends in an arc from the shoulders to the central chest; flanks and abdomen velvet black, with faint bronze and green bars; wings blackish brown, with traces of iridescent blue and green at bend of wing; under wing coverts dusky black washed faintly with purple; tail sharply graduated and blackish except central rectrices which are tremendously elongated (up to 995 mm. in length), very narrow (not more than 25 mm. wide), and pure white except at the tips which are narrowly tipped with black (30 mm. or less) and with

the shafts black near the tip; lateral tail feathers very short; feet in life dark gray.

DIFFERENTIAL DIAGNOSIS: Differs from *stephaniae* by having the central pair of tail feathers white with black tips, not solid black; crown bright yellowish green, not greenish blue; back deep blackish, with a greenish bronze sheen (feathers of a more velvety texture), not bright bronze with a satin gloss; feathers of forehead overhanging the culmen much lengthened to form a conspicuous pom-pom (in addition to the diagnostic characters true for all plumages, see above).

ADULT FEMALES

Forehead, crown, nape dull iridescent green, with a golden or bluish wash; chin, throat, sides of head, and upper chest dull glossy bluish green, becoming darker, more bluish on the ear coverts and sides of neck and breast; shoulders and upper back brownish black, with bluish reflections; feathers of lower back, rump, and upper tail coverts black, with broad brown edges (which in turn are sometimes narrowly barred with black); wings dark brown; lower chest, flanks, abdomen, and under tail coverts buff or rufous barred with black; tail very variable, either solid brown or with varying amounts of white on the central rectrices. If white is present, it is usually restricted to the inner two-thirds of the tail in two lateral stripes, each of which is bordered with dark brown. Under wing coverts dark brown, with rufous tipping.

DIFFERENTIAL DIAGNOSIS: Differs from *stephaniae* by having forehead, lores, malar region, crown, and nape iridescent green with a golden tinge, not velvet blue-black; chin, throat, ear coverts, sides of neck and upper chest dull iridescent blue-green, not deep black (with a faint greenish bronze tinge on chin and throat); black of throat extending farther down on the chest (in addition to the diagnostic characters true for all plumages, see above).

VARIABILITY: The only character that varies significantly is the tail. Based on field observations and study of collected specimens, approximately one-third of adult females have no white in the tail, one-sixth have a little white (less than 1 per cent), one-sixth have 1 to 10 per cent, one-sixth have 11 to 35 per cent, and one-sixth have between 35 and 75 per cent of the tail white.

IMMATURE MALES

Like adult female (of *mayeri*) but lower flanks, abdomen, and under tail coverts blackish, with weak buff to brown barring, not light buff to rufous heavily barred with black; under wing coverts solid blackish brown, not dark brown with strong buff to rufous tips.

DIFFERENTIAL DIAGNOSIS: Has a more "advanced" plumage than the immatures of *stephaniae* throughout; head, back, and throat brighter, more glossy, more as in the adult male; abdomen blackish, with only weak indications of brown barring, not light buff to rufous heavily barred with black (in addition to the diagnostic characters true for all plumages, see above).

SUBADULT MALES

The plumages that occur between the immature and the adult plumage are not yet fully understood. Specimens in such intermediate plumages can for the time be united under the heading of subadults. They have the following distinguishing characters: upper parts with glossy colors much brighter, more pinkish purple, than in the immature males and not deep velvety black with bronze reflections as in the adult male; pom-pom and forehead intermediate in glossiness between immature and adult; the dark purplish blue cheek area more extensive and brighter blue than in immature and not velvety black with bronze reflections as in the adult; tail averaging longer (see table 1).

It is interesting to note that in subadult males the extent of white in the tail has no apparent correlation with the coloration of the body plumage or with size. One specimen has very long central tail feathers (573 mm.), yet they are completely edged with brown as in most of the immature and subadult males (not pure white except on the tip as in the adult male). Of two others with the central tail feathers longer than average, one has plumes which are less than 2 per cent white and the other has none at all.

VARIABILITY: Immature and subadult males vary but little except with regard to the tail which assumes many patterns. In general, field and museum studies indicate that less than 10 per cent have the tail solid brown; 50 per cent have the tail less than half white; and about 40 per cent have the tail between 50 and 80 per cent white. No immature males were observed which had the tail more than 80 per cent white, yet in the adult male it is

about 97 per cent white. Thus the subadult male averages more white in the tail than does the adult female.

NESTLINGS

Nestlings of *Astrapia* were obtained on Mt. Hagen (*mayeri*, male, 8200 \pm feet, July 19, 1950) and Mt. Wilhelm (*stephaniae*, female, 9000 \pm feet, June 7). They are exceedingly similar, except as follows: *mayeri* has the upper parts with a faintly lighter cast, more dull greenish, less deep bluish; abdomen and under tail coverts darker due to narrower, less bright, and less well-defined light barring and broader black barring; dark area of chest more extensive, extending farther down the chest.

MOLT

All of the specimens of *mayeri* at hand were collected in July. Most are in fresh plumage. In some males, however, the white tail feathers are badly worn, and in others they are in molt. Evidence that most of our birds had undergone their molt shortly prior to July is indicated by the presence of fragments of sheath still adhering to the feather bases, particularly on throat, ear coverts, and crown. One adult male, collected July 15, is abnormal in that it was in full molt with practically all of the flight plumes and most of the feathers of the body wholly or partially encased in sheathing.

SYNONYMY

Kuroda (1943) described another "species" of *Astrapia*, *A. recondita*, on the basis of two specimens. Type and paratype are described as adult males, but the excellent color plate of *A. recondita*, as well as description and measurements, shows that both birds are subadult males. They completely agree with subadults of *mayeri* in all points of coloration, such as the blackish abdomen (heavily barred in *stephaniae*), the purplish glossy back (dull sooty black in *stephaniae*), and the green crown (bluish in *stephaniae*). They also agree with *mayeri* (and differ from *stephaniae*) in the size of the frontal tuft, in the pointed tail feathers, in the length of the longest pair of lateral tail feathers (135 mm., 160 in *recondita*, 130–170 in *mayeri*, 190–220 in *stephaniae*), in the length of the wing (173, 174.5), and in the length of the bill (from nostril 14 + x, 17). The only suggestion of a possible introgression of *stephaniae* blood is presented by the shortness of the central tail

feathers, which measure 335, 335, as against 360–573 in subadult *mayeri* (see table 1). Although stated in the original description to have been collected probably in the Morobe district, there is no reason to doubt that these specimens were obtained in the Mt. Hagen area.

DISTRIBUTION

Recent investigations have largely clarified the geographical features of central New Guinea, as well as the geographical distribution of the various populations of *Astrapia*. It is now evident that the species *stephaniae* ranges from southeastern New Guinea not only to the Herzog Mountains (fig. 2, 2) but farther westward for a distance of at least 230 miles through the Bismarck Mountains to Schraderberg (fig. 2, 1) (Sepik ranges). It also occurs on the Wahgi Divide (fig. 2c), a spur of the Bismarck Mountains which extends westward in the direction of the Hagen Mountains. Finally, *A. stephaniae* occurs also on the Kubor Mountains (fig. 2d), a chain south of and parallel to the Bismarcks. The Kubor population is now completely isolated, since the cordillera on which it occurs is encircled by a wide belt of grassland.

Astrapia mayeri is known only from the Hagen Mountains and the mountains to the west of them (to longitude 142° 30' E.). The ranges of *mayeri* (forests of Mt. Hagen) and of *stephaniae* (forests of Wahgi Divide) are at present completely separated from each other by a belt of grassland, several miles wide, in the pass between the two ranges (see fig. 2). The junior author had twice during 1950 the opportunity to examine this gap from a low-flying aircraft while traveling between Nondugl and the Hagen airstrip.

Much, if not all, of the grassland of this area is man made and of recent origin. The fact that Shaw Mayer found a hybrid population between *mayeri* and *stephaniae* just west of the gap indicates that there was a continuous belt of forest until rather recent times. It would be virtually impossible for a bird like *Astrapia* to cross belts of grassland several miles wide.

It is well known that there has been an alternation of humid and arid periods in Australia in the Pleistocene and post-Pleistocene. It is more than probable that this cycle affected New Guinea in a similar manner, although presumably less drastically. The original separation of *A. stephaniae* and *mayeri* must have taken place during one of the dry periods, when the forests of the Mt.

Hagen area and those of the Bismarck Mountains were separated for a particularly long period.

THE TAXONOMIC POSITION OF *ASTRAPIA MAYERI*

Stonor in his original description stated that *A. mayeri* is intermediate between *A. splendidissima* and *A. stephaniae* both

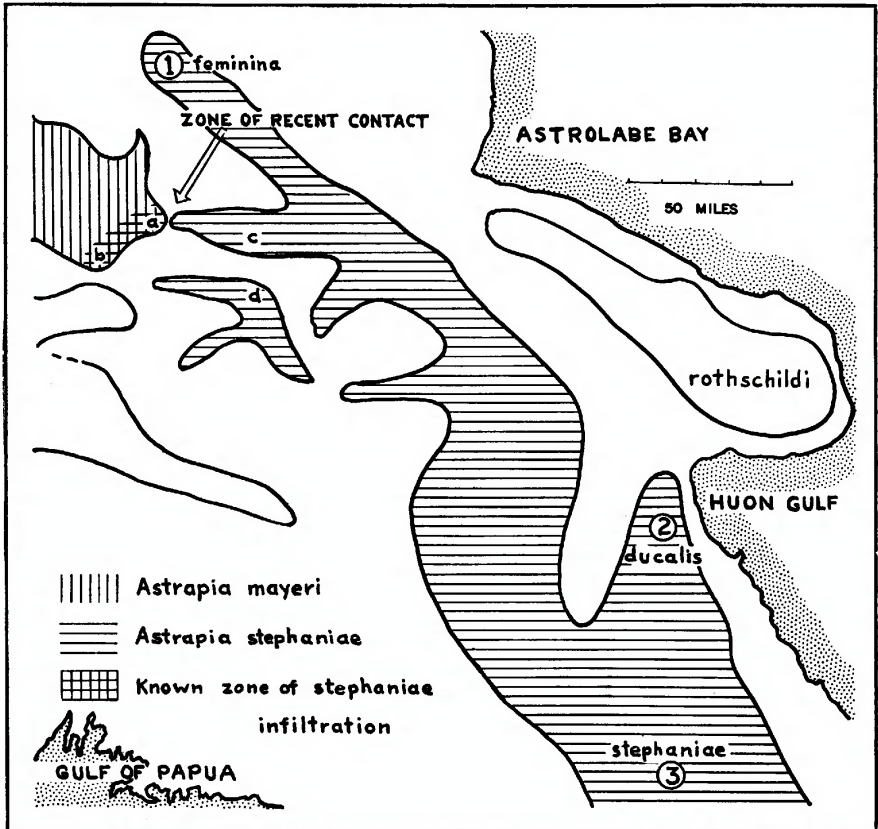


FIG. 2. Range of *Astrapia* in east central New Guinea. Collecting stations a, b, c, d are discussed in the text.

geographically and in some of its characters. This still left undetermined to which of the two it is closer and whether or not it is justifiable to retain it as a full species. Notwithstanding the diagnostic differences of *A. mayeri*, pointed out above, it is obvious that this form is exceedingly similar to *A. stephaniae* except for the tail. The color of the under parts of adult males is virtually identical, while that of *A. splendidissima* is very different. With respect to the tail, *mayeri* differs from both *splendidissima* and

stephaniae. It shares with *stephaniae* the length of the tail (although exceeding even *stephaniae*) and with *splendidissima* the whiteness of the tail. It differs from both by (1) the narrow, pointed form of the tail feathers, (2) their great length and different proportions, and (3) the much greater amount of white in the adult male.

Are *A. mayeri* and *A. stephaniae* geographically isolated and, if not, are they reproductively isolated in the zone of contact? The collections of Shaw Mayer and Gilliard indicate that the two species were not completely isolated geographically until very recently and that they hybridized freely in the zone of contact (fig. 2).

Immediately west of the present gap (see fig. 2a) a population was found by Shaw Mayer¹ in which virtually every specimen is a hybrid, but with a stronger admixture of *mayeri* than of *stephaniae* (Banks, 1950). One adult male is very close to pure *mayeri*, but no bird is close to pure *stephaniae*. Owing to the kindness of Mr. E. Banks, one of us (Mayr) was able to examine this series, which is preserved in the British Museum. In the series of birds collected by E. T. Gilliard (at stations marked b, fig. 2) most specimens are apparently pure *mayeri*, but some have a few characters indicating an introgression of *stephaniae* genes. This is indicated by the greater width of the terminal portion of the tail, the greater amount of black at the tip of the tail, the shape of the tip of the tail, wing length, tail length, color of back, color of the crown, relative length of lateral tail feathers, length of bill, and size of pom-pom above bill. Gilliard's locality is about 15 miles west of the grassland gap which presumably separates the ranges of *stephaniae* and *mayeri*. It still remains to be determined how far west this area of infiltration of *stephaniae* genes extends and also whether or not an effect of *mayeri* is visible in the *stephaniae* population east of the gap. No indication of it was noted in Gilliard's collections from the Wahgi Divide (see fig. 2c) 45 to 65 miles east of the grassland gap nor in the Kubor Mountains (see fig. 2d). "*Astrarchia barnesi*" of Iredale (1948, p. 162) from the "Mt. Hagen district" is a bird from a hybrid population. The type appears to be somewhat closer to *stephaniae* than to *mayeri*.

¹ Shaw Mayer writes us (letter dated January 5, 1952) that most of his "so-called mixed astrapias came from Yanka on the east slopes of the main Hagen Range [fig. 2a], but a few also came from near Tomba [fig. 2b]."

It is thus clearly established that *mayeri* and *stephaniae* are exceedingly close biologically and that they freely interbreed where they come in contact. It is also well established now that the two are rather similar to each other, differing most strikingly in the tail. It would seem logical to propose to consider *mayeri* as conspecific with *stephaniae*. This is precisely what Banks (1950) has done. The as yet unknown male of *feminina* might strengthen the case for such a classification. The only reason that we have tentatively retained *mayeri* as a full species is that in addition to its unique tail it differs also in proportions, shape of bill, frontal feathering, and other diagnostic characters mentioned above. The wide range of the black-tailed *stephaniae* (with its three subspecies) also militates in favor of keeping it an entity separate from *mayeri*. The breakdown of geographical isolation between *stephaniae* and *mayeri* is apparently a recent event and has not yet obliterated the striking difference between the two except in a narrow belt of hybridization. Retaining *mayeri* as a full species brings out the important zoogeographical fact of the former separation of ranges between *mayeri* and *stephaniae*.

HABITAT

Astrapia mayeri is the most common bird of paradise and one of the most common of bird inhabitants of the original forests of Mt. Hagen where it occurs between the levels of 7800 and 10,800 feet (in the Tomba region). In the 7800- to 8500-foot zone, where the junior author made his observations during the month of July, the Ribbon-tail lives in the upper third of the trees in the forest. The trees average 80 feet in height. In this zone the apparently silent *Astrapia* lives side by side with three other birds of paradise, all of which are very noisy, viz., *Epimachus mayeri*, *Pteridophora*, and *Loria*.

Females or immature males of *mayeri* were frequently observed feeding precariously on the tops of clusters of leaves in the canopy of the forest. They were usually solitary. An adult male with a long white tail was observed sitting for at least 10 minutes in the crown of a sentinel oak tree, 90 feet up, at about 10 A.M. on July 27. During the period of observation this individual preened continuously, paying much attention to the grooming of its rump and tail, and, in so doing, often causing the spectacular tail to swing sidewise or obliquely forward. It is possible that this

male was on his dancing limb. This sequence was photographed in color on motion picture film.

The highest record is that of a subadult male taken in stunted moss forest at 10,800 feet within 200 feet of tree line.

NEST

Five nests were brought into base camp by natives. One, received July 11, contained a living nestling about eight days old.

The nest in which the young bird was found is 10 inches in diameter by 4 inches in depth. It consists of a well-defined cup 2 inches deep and 4 inches wide, lined with thread-like rootlets, possibly of air plants, and a few large fragments of thick leaves, each nearly an inch long. The nest foundation is composed of a spiral pile of thin, vine-like, orchid stems. When collected these were alive and thriving as indicated by the presence of many small green leaves.

ASTRAPIA STEPHANIAE

This species is so well known that it would be superfluous to give a full description. Only a few words need be said about its geographical variation. It is now evident that three subspecies are to be recognized.

1. *Astrapia stephaniae stephaniae* Finsch: Found in the Owen Stanleys and adjacent ranges of southeastern New Guinea.

Wing, female adult, 147 mm.—156 (151.5).

2. *Astrapia stephaniae ducalis* Mayr: This subspecies is found from the Kubor and Bismarck Mountains in the west to the Herzog Mountains in the east. Adult males are like those of *stephaniae*. It is characterized in the female and immature plumages by blacker, less brownish, upper parts and shorter wing.

Wing, female adult, Herzog Mountains, 146–150 (147.2); Wahgi region, 145–151 (145.8).

The recent records of this species from the Kubor and Bismarck Mountains constitute a considerable westward extension of the range.

3. *Astrapia stephaniae feminina* Neumann: Known only from Schraderberg.

Wing, female, 146–152.

Differs from the other subspecies by the more rufous, less buffy, under parts of the female and by somewhat shorter outer tail feathers; it has the shorter wing of *ducalis*.

A single adult female examined by us has some white on the web of the central tail feathers near the base. This might indicate gene flow from *mayeri* or even an intermediate position of *feminina*. However, *feminina* is a true *stephaniae* in all other characters, and white is also found occasionally in otherwise typical specimens of nominate *stephaniae*. Such, for example,

TABLE 1
MEASUREMENTS (IN MILLIMETERS) OF *Astrapia mayeri* AND *A. stephaniae*

	<i>mayeri</i>			<i>stephaniae</i>		
Adult males						
Wing	172	-180	(176.8)	165	-169	(167.0)
Tail: central feather	857	-995	(927.6)	639	-655	(645.2)
Tail: distance between 1 and 5	46	- 53	(49.0)	90	-107	(101.0)
Bill from nostril	16	- 18.5	(17.5)	20	- 24	(22.1)
Bill from nasal tuft	9	- 12	(10.2)	20	- 24	(22.1)
Subadult males						
Wing	169	-181	(173.7)	165	-169	(166.4)
Tail: central feather	360	-573	(407.0)	363	-391	(377)
Tail: distance between 1 and 5	54	- 63	(59.0)	115.5-125		(120)
Bill from nostril	17	- 18	(17.1)	22	- 23	(22.3)
Bill from nasal tuft	11.5- 12.5		(12.0)	22	- 24	(22.5)
Immature males						
Wing	164	-168	(166.1)	153	-163	(159.0)
Tail: central feather	315	-406	(365.1)	322	-358	(342.2)
Tail: distance between 1 and 5	52	- 70?	(63?)	113	-124	(117.8)
Bill from nostril	16.5- 18		(17.0)	21.5- 23		(22.1)
Bill from nasal tuft	14.5- 15		(14.9)	21	- 23	(22)
Adult females						
Wing	153	-160	(156.5)	152	-155	(153)
Tail: central feather	284	-351	(311.3)	332	-364	(342.3)
Tail: distance between 1 and 5	54	- 64	(58.4)	118	-137	(125)
Bill from nostril	16.5- 19		(17.6)	20	- 23.5	(21.9)
Bill from nasal tuft	14	- 17	(15.8)	20	- 24	(22.1)

are two adult males from southeastern New Guinea (A.M.N.H. Nos. 678054 and 678058), both of which have small but vivid white areas at the base of the central rectrices. A Kubor Mountain dance plume collected by the junior author has a similar pattern.

The series of *stephaniae* recently collected in the Bismarck Mountains shows a slight approach towards *feminina* in that females have the under parts averaging slightly richer rufous, less buffy, than in the series from farther east.

ACKNOWLEDGMENTS

We are greatly indebted to Mr. James C. Greenway for the loan of a series of *A. s. ducalis* in the Museum of Comparative Zoölogy and to Mr. E. Banks for the permission to examine material in the British Museum (Natural History), in particular a sample from a hybrid population between *stephaniae* and *mayeri*.

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